

REMARKS

The Office Action mailed March 18, 1999 has been received and reviewed. Claims 3-6, 8, 11, 12, and 15-20 have been amended. Claims 1-20 are pending.

The Examiner has indicated that claims 5-8, 10, 12 and 17-20 were allowable, but objected to as depending on a rejected claim. Thus claims 5, 6, 8, 10, 12, and 17-20 are amended solely to make them in independent form in order to remove the objection. **Please charge any additional required fees or credit overpayment to Deposit Account No. 19-0743.**

Rejection Under 35 U.S.C. 102 citing Shirley et al.

Claims 1, 2, 9, 13 and 14 were rejected under 35 U.S.C. 102(b) as being anticipated by Shirley et al., U.S. Patent No. 4,784,154. Applicants respectfully traverse this rejection on the grounds discussed below. Shirley discusses "An interference resistant biomedical transducer for monitoring the acoustic output of a patient's cardiac or respiratory system which provides a high degree of rejection of acoustic noise and spurious electromagnetic signals. The transducer comprises a piezoelectric diaphragm assembly having electrodes which produce a differential output signal. The transducer housing includes a massive metal disc and a compliant handle which provide a mechanical filter to remove undesired signals such as those related to motion of the patient and ambient acoustic noise." (Shirley abstract.)

The Shirley transducer (see Fig. 3) provides a diaphragm assembly 12 having a piezoelectric disc 22 mounted directly on the metal disc diaphragm 20. The metal disc is 1.25 inch in diameter, and the ceramic disc epoxied to its surface is 1 inch in diameter (As discussed in column 3 line 55 to col 4 line 19). Each disc is 0.01 inch thick. Thus there is no portion of the Shirley piezoelectric disc in a fixed relationship to the housing, but rather the entire piezoelectric disc, being smaller than the metal disc, flexes with the center portion of the metal disc. Further, the Shirley transducer is described as: "A biomedical transducer diaphragm assembly having the above dimensions has a free air resonance of approximately 7 kilohertz." This is also mentioned in claim 8. No range of frequencies or other frequency response is taught.

In contrast, the present invention of claim 1 calls for "a piezoelectric device having a first portion mounted in a fixed relationship to the housing and a second portion displacementally coupled to the diaphragm." Further, claim 1 recites "the device and amplifier together have a frequency response at least including a range from below approximately 1 hertz to above approximately 250 hertz." The present invention provides important information not available in

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the sensor of Shirley. Applicants respectfully submit that neither of these limitations of claim 1 is taught or even obvious from Shirley. Thus, claim 1 and all of its dependent claims (2-10) appear to be in condition for allowance, and such action is respectfully requested.

As to claim 9, Applicants respectfully traverse the Examiners assertion that Figure 5A shows an constant current source. No such structure is shown or described. Figure 5A merely shows "The positive electrode 24' is connected to the inner conductor of a coaxial cable 32' which is further connected to an appropriate amplifier 34'." (col 4 line 31).

In contrast, the present invention teaches and claim 9 claims "a sensor according to claim 1, further comprising a constant-current source coupled to the amplifier." Thus, claim 9 appears to be in condition for allowance, and such action is respectfully requested.

As to method claim 13, Applicants respectfully traverse the Examiners characterization of the frequency response of the transducer Shirley describes. Column 4 line 19 describes only "a free air resonance of approximately 7 kilohertz." This is also mentioned in claim 8. No range of frequencies or other frequency response is taught.

In contrast, the present invention of method claim 13 calls for "the steps of displacing, converting, and amplifying together have a frequency response at least including a range from below approximately 1 hertz to above approximately 250 hertz." This clearly distinguishes from Shirley. Thus, claim 13 and all of its dependent claims (14-20) appear to be in condition for allowance, and such action is respectfully requested.

Rejection Under 35 U.S.C. 103 citing Shirley et al.

Claims 3, 4, 11, 15 and 16 were rejected under 35 U.S.C. 103(a) as being unpatentable over Shirley et al., U.S. Patent No. 4,784,154. Applicants respectfully traverse this rejection on the grounds discussed above, and further on the additional grounds below. Shirley describes a sensor having a 1.25-inch diameter skin-contact diaphragm. Shirley does not address the need for a sensor designed for the radial artery.

In contrast, the present invention provides a solution for a radial-artery sensor; one that is optimally sized for the spacing of tendons and bone ridges in the human arm and wrist- not so large that bridging on bones and tendons occurs to prevent diaphragm displacement, not so small that the sensor completely flattens or crushes the artery being measured. The sizes recited in the

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AMENDMENT AND RESPONSE

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claims are not mere engineering choice as asserted by the Examiner, but rather have been invented to provide the optimal size to measure the artery between the bony ridge on the radius bone on the thumb side of this artery, and the tendons on the other side of the wrist relative to the artery. The Shirley reference does not address this need, nor does it provide the specified size. The other references (e.g., Hugli et al, which describes a sound sensor with a "diameter of the lower flange 98 of endpiece 50 may be approximately 0.468 inch") may include sensors having sizes similar to those in the present claims, but they do not address this particular problem of obtaining sound from the radial artery in the human wrist. Thus, claims 3, 4, 11, 15 and 16 appear to be in condition for allowance, and such action is respectfully requested.

The Examiner has indicated that claims 5-8, 10, 12 and 17-20 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. Each of these previously dependent claims have accordingly been rewritten, and are now believed to be in condition for allowance. In addition, the base claims appear to be in condition for allowance for the reasons discussed above.

Supplemental Information Disclosure Statement

The Applicants are submitting herewith a Supplemental Information Disclosure Statement describing a sensor sold more than one year before the filing of the present application. Applicants respectfully submit that the claims as amended above also distinguish over this prior art, and are in condition for allowance.



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CONCLUSION

Applicants believe that all of the claims are now in condition for allowance. Applicants request reconsideration of the application and early allowance of pending claims 1-20. The Examiner is invited to telephone the below-signed attorney at 612-373-6949 to discuss any questions that may remain with respect to the present application.

Respectfully submitted,

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Date 18 June 1999 By Charles A. Lemaire
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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Assistant Commissioner of Patents, Washington, D.C. 20231 on June 18, 1999.

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